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AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A sub-manager for interfacing between an SNMP network management system and a plurality of SNMP managed clients, each of such SNMP managed clients being served by a network address translation firewall, the sub-manager comprising:

a computer executing instructions encoded on a computer-readable medium, the instructions comprising:

a network management agent instructing the sub-manager to: for i) ~~receiving~~ i) receive a master SNMP network management request message from the SNMP network management system; and ii) provide ~~providing~~ a master SNMP response message to the SNMP network management system;

wherein, the master SNMP network management request message includes a plurality of variable values, each variable value being identified by a master object identifier selected from a master information base, each master object identifier comprising:

a client identifier that identifies a particular one of the plurality of SNMP managed clients which has a client management information base that includes a requested variable value; and

a variable identification portion, the variable identification portion being a client object identifier that identifies the variable value within the client management information base;

a connections module instructing the sub-manager to, for each of the plurality of SNMP managed clients:

establish ~~establishing~~ an internet protocol connection with such SNMP managed client through the firewall serving such SNMP managed client; and

both: i) provide, ~~providing~~, to each of the plurality of SNP

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managed clients, a client network management request message; and ii) ~~receive~~ ~~receiving~~, from each of the plurality of SNMP managed clients, a client response message, in each case, through the internet protocol connection; and

a message handling module ~~instructing the sub-manager to: [[for:]]~~ ~~receive~~ ~~receiving~~ the master SNMP network management request message;

for each master object identifier included in the master SNMP network management request message, ~~generate~~ ~~generating~~ the client network management request message, the client network management request message including the client object identifier that identifies the variable value within the client management information base; and

~~generate~~ ~~generating~~ the master SNMP response message from each received client response message;

wherein each client response message ~~includes~~ ~~including~~ the client object identifier and the variable value from the client management information base; and

wherein the master SNMP response message includes each of the master object identifiers, and each of the master object identifiers is associated with the variable value received in the client response message.

2. Canceled.

3. (Currently Amended) The sub-manager of claim 7, wherein:

each internet protocol connection is a TCP/IP connection that is established with the SNMP managed client, through the firewall serving the SNMP managed client in response to receiving a connection request initiating by the SNMP managed client;

the connections module further, in response to receiving an SNMP inform message from the SNMP managed client through the internet protocol connection, the SNMP inform message including the SNMP managed client's client identifier:

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instructs the sub-manager to:

spawn to the computer readable medium spawns a device state machine for the SNMP managed client; and

record records in an active connections table and in association with the client identifier:

a client connection identifier, the client connection identifier comprising the source IP address and source port number of the SNMP inform message initiated by the SNMP managed client and translated by the firewall serving the client; and

a device state machine identifier identifying the device state machine; and

the device state machine instructing the sub-manager to providing the client network management request message to the SNMP managed client by providing the client network management request message over the internet protocol connection that associates, in the active connections table, with the client identifier of the master object identifier.

4. Canceled.

5. (Currently Amended) The sub-manager of claim 7, wherein the device state machine further instructs the sub-manager to: provides for:

receive each periodic periodically receiving a heart beat message from the SNMP managed client over the internet protocol connection; each heart beat message including the client identifier and a time interval between the heart beat message and a subsequent heart beat message;

update updating the client connection identifier in the active connection table if the source IP address or the source port number obtained from the heart beat message differs from that of a previous heart beat message;

provide providing a heart beat acknowledgement message to the SNMP managed client over the internet protocol connection; and

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~~determined~~ determining that the internet protocol connection is inactive if a time period in excess of the time interval elapses during which a subsequent heart beat message has not been received.

6. (Previously Presented) The sub-manager of claim 5, wherein the master SNMP response message includes an indication that the a value does not exist if the value is associated with a master object identifier that includes a client identifier associated with an SNMP managed client with which the Internet protocol connection is inactive.

7. (Previously Presented) The sub-manager of claim 1, wherein:
the master SNMP network management request message comprises at least two master object identifiers, each master object identifier comprising a client identifier that is unique from the client identifier of at least one other master object identifier,

8. (Currently Amended) The sub-manager of claim 7, wherein the message handling module further instructs the sub-manager to: ~~provides for:~~

receive ~~receiving~~ an asynchronous client Trap message initiated by the SNMP managed client over the internet protocol connection established with the SNMP managed client, the asynchronous client Trap message including the a client object identifier and a variable value associated with the client object identifier;

identify ~~identifying~~ the SNMP managed client that initiated the asynchronous client Trap message; and

generate ~~generating~~ an asynchronous master Trap message and providing the asynchronous master Trap message to the SNMP network management system, the asynchronous master Trap message including the value and a master object identifier, the master object identifier including the client identifier identifying the SNMP managed client that initiated the asynchronous client Trap message and

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a variable portion identifying the variable value, the variable portion being the client object identifier.

9. Canceled.

10. (Currently Amended) A method of operating a sub-manager computer to interface a management information base of variable values interfacing between an SNMP network management system and a plurality of remote SNMP managed clients, each of such remote SNMP managed clients being coupled to a local area network served by a network address translation firewall which couples the local area network to the internet, the method comprising:

for each of the plurality of SNMP managed clients, establishing an internet protocol connection with the SNMP managed client through the firewall serving the SNMP managed client;

receiving a master SNMP network management request message from the SNMP network management system, the master SNMP network management request message including a plurality of variable values, each variable value being identified by a master object identifier selected from a master information base, each master object identifier comprising:

a client identifier that identifies a particular one of the plurality of SNMP managed clients which has a client management information base that includes a requested variable value; and

a variable identification portion, the variable identification portion being a client object identifier that identifies the requested variable value within the client management information base;

for each master object identifier included in the master SNMP network management request message, generating a client network management request message, each ~~[[the]]~~ client network management request message including the client object identifier that identifies the variable value within the client management information base;

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providing each client network management request message to the particular one of the SNMP managed clients identified by the client identifier over the internet protocol connection established with such particular one of the SNMP managed clients;

receiving, from each SNMP managed client, a client response, each client response message including the client object identifier and the variable value from the client management information base;

aggregating each client response message to generate a master SNMP response message, the master SNMP response message including each of the master object identifiers and each master object identifier being associated with the variable value received in the client response message; and

providing the master SNMP response message to the SNMP network management system.

11. Canceled.

12. (Previously Presented) The method of claim 16, wherein:

for each SNMP managed client, the internet protocol connection is a TCP/IP connection established through the firewall serving the SNMP managed client, in response to receiving a connection request initiating by the SNMP managed client;

the method further comprises in response to receiving an SNMP inform message from the SNMP client through the internet protocol connection, the SNMP inform message including the SNMP managed client's connection identifier:

spawning a device state machine for the SNMP managed client; and
recording, in an active connections table in association with the client identifier:

a client connection identifier, the client connection identifier comprising the source IP address and source port number of the SNMP inform message initiated by the SNMP managed client and translated by the firewall serving the client; and

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a device state machine identifier identifying the device state machine; and

the step of providing each client network management request message to the SNMP managed client comprises providing each client network management request message over the internet protocol connection that associates, in the active connections table, with the client identifier of the master object identifier.

13. Canceled.

14. (Previously Presented) The method of claim 16, further comprising:
periodically receiving a heart beat message from the SNMP managed client over the internet protocol connection; each heart beat message including the client identifier and a time interval between the heart beat message and a subsequent heart beat message;

updating the client connection identifier in the active connection table if the source IP address or the source port number obtained from the heart beat message differs from that of a previous heart beat message;

providing a heart beat acknowledgement message to the SNMP managed client over the internet protocol connection; and

determining that the internet protocol connection is inactive if a time period in excess of the time interval elapses during which a subsequent heart beat message has not been received.

15. (Previously Presented) The method of claim 14, wherein the master SNMP response message includes an indication that the value is unavailable if an open internet protocol connection does not exist with the particular one of the SNMP managed clients.

16. (Previously Presented) The method of claim 10, wherein:
the master SNMP network management request message comprises at

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least two master object identifiers, each master object identifier comprising a client identifier that is unique from the client identifier of at least one other master object identifier.

17. (Previously Presented) The method of claim 16, further comprising:

receiving an asynchronous client Trap message from the SNMP managed client over the internet protocol connection established with the SNMP managed client, the asynchronous client Trap message including the client object identifier and a variable value associated with the client object identifier;

identifying the SNMP managed client that initiated the asynchronous client Trap message;

generating an asynchronous master Trap message and providing the asynchronous master Trap message to the SNMP network management system, the asynchronous master Trap message including the variable value and a master object identifier, the master object identifier including the client identifier identifying the SNMP managed client that initiated the asynchronous client Trap message and a variable portion identifying the variable value, the variable portion being the client object identifier.

18. Canceled.